Dismounted Infantry Cognitive Task Analyses

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Future Soldier Systems

Background

- SIREQ Technology Demonstration
- What are the critical information requirements?
- What are the current capability gaps?
- Why technology?
- R&D programme plan
- Focus on:
  - Dismounted Infantry
  - Section level
  - Section Comd and Rifleman roles

Modified CTA Approach

- Operational Scenarios
- Function Flow Diagrams
- Knowledge Audit
- Information Indice Ratings
- Attentional Demands Ratings
- Measures of Effectiveness
- Information Technology Goals

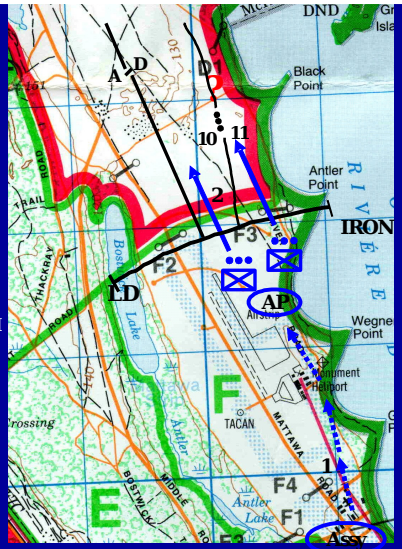
Operational Scenarios

- Attack Wooded
- Defend
- Patrol
- Urban Assault

Scenario Overview

Concurrently, D company is carrying out ***preparation for battle (1)*** in the assembly area, under the direction of the platoon warrants. The OC D Coy's Recce party has moved forward to look beyond phase line IRON. As per orders, D Coy 1 RCR links up with 3 RCR to guide the company as they move to the Attack Position (AP). In the Attack Position, 11 Platoon shakes out into its advance to contact formation (i.e. 2 up). 1 Section (LEFT forward) and 2 Section (RIGHT forward) shake out into extended line formation.

The company crosses the line of departure at H hour and ***advances to contact.*** 2 Section uses tactical formations (i.e. arrowhead and extended line formations). Positive control is maintained by Coy HQ to ensure that 10 Platoon and 11 Platoon advance together. Control measures include report lines and boundaries. Upon encountering effective enemy fire, all members of the rifle section ***react to effective enemy fire (2).*** No. 2 Section Comd reports "CONTACT WAIT OUT!".



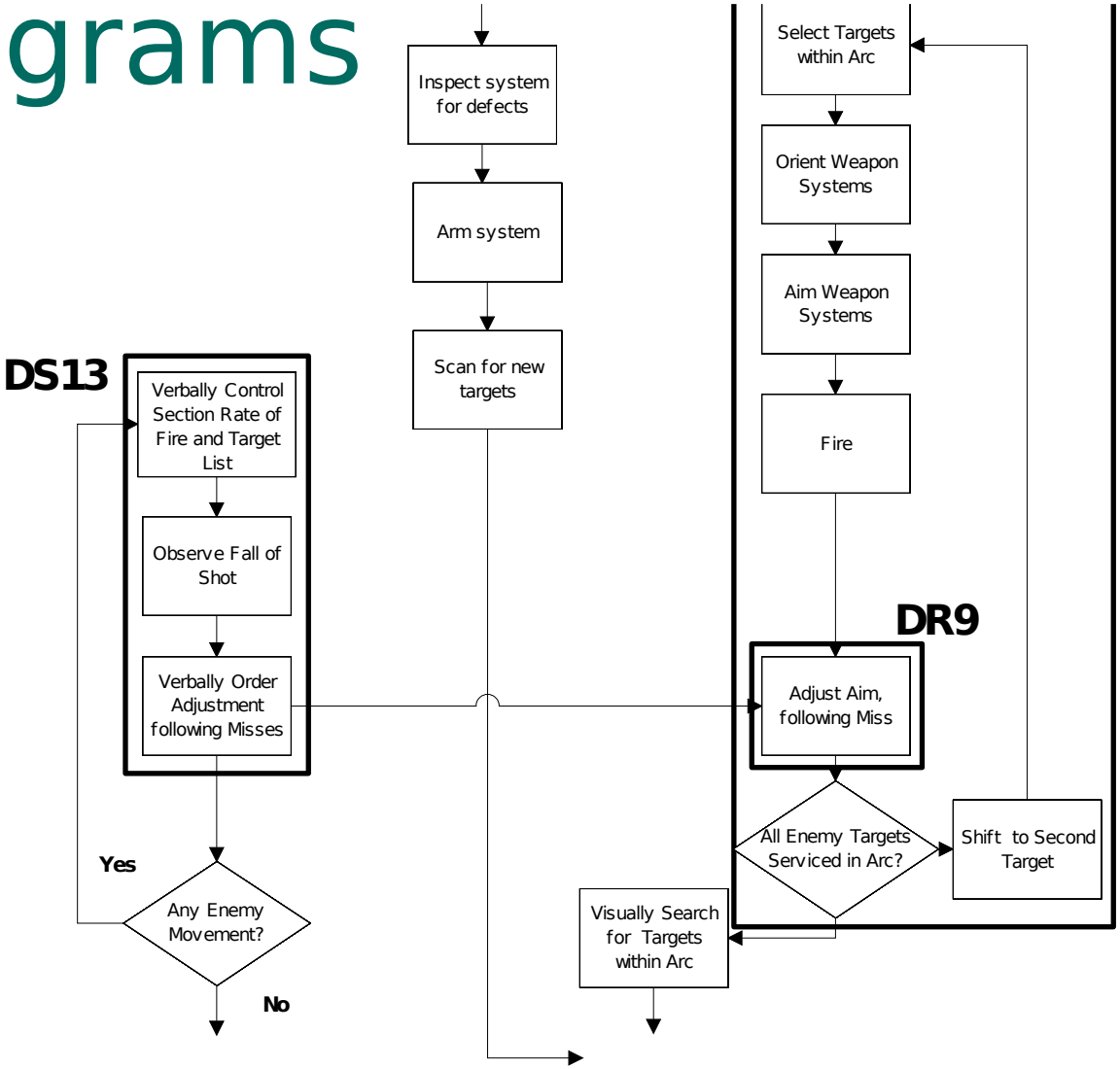
Locating the Enemy

...e aim is now to locate and determine the ...ze and composition of the enemy ...sition. Given a determined enemy this ...ill can be quite difficult.

...e Sect Comd verbally requests his ...ction members to indicate the enemy ...sition. Speculative fire is used to try to ...rce the enemy to reveal their location. ...e enemy can still not be located. The ...ction moves forward using fire and ...ovement covered by smoke.

...n isolated enemy trench is located and ...e enemy strength is estimated.. Holding ...s rifle above his head, the Sect Comd ...ints out the general direction of the ...emy to the other members of the section. ...e Section Comd then radios a detailed CONTACT REPORT to the Pl Comd.

Function Flow Diagrams



Knowledge Audit

- Task Description
  - What, How, Who, Cues
  - Volume/Amount
- Timings
- Cognitive Issues
  - Awareness
  - Decisions
  - Communications
  - Workload Issues
  - Training (novice/expert)
- Workload Ratings
- Information Indices
  - Importance
  - Complexity
  - Timeliness
  - Difficulty
  - Retention
  - Update Frequency
  - Frequency of Use
  - Accuracy
  - Time Pressure
- Measures of Effectiveness
- Information Technology Goals

Knowledge Audit Results

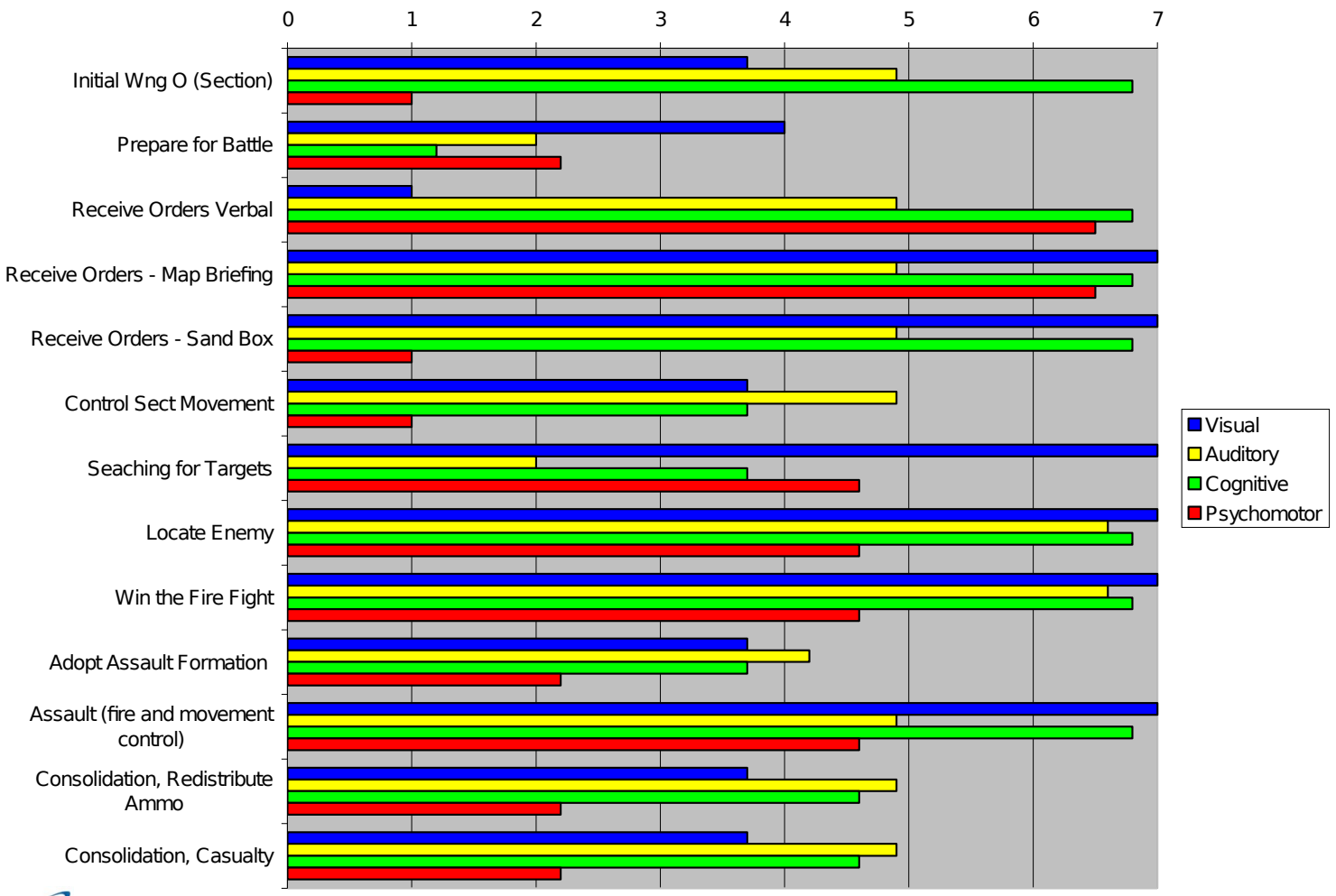
Fnc Flow	Task Description	What	Who	How	Why
AS1	Receive Warning Orders (from Platoon)	Probable mission, timings, direction and special instructions.	Platoon comd to Section comd.	A verbal briefing from Platoon Comd or signaler using radio orders, or a textual order delivered by a runner. (Note: Section comd usually brings runner to Warning Orders to be able to send early information and special instructions back to the Section 2nd in command.)	Provides Section comd with information that allows them to do time appreciation in preparation of specific mission. Once given the overview of mission (e.g. distance to objective and likely enemy) Section comd can integrate with map reconnaissance and weather to estimate rations, ammo and appropriate clothing etc.
AS2	Quick Map Reconnaissance to Prepare Warning Orders	Use map info (in conjunction with mission and weather) to create Warning Order for own section. Key is obstacles, terrain, boundaries, objective and likely route.	Section Comd does map reconnaissance and prepares Warning Orders.	Review map and relate special instructions.	
AS3	Prepare Warning Orders	Integrate available information and procedural knowledge to identify obstacles, terrain, boundaries, routes, woods, likely fire base locations, objective (enemy), snow and ice, rivers, swamp etc.	Section comd for Section.	Review all information, and special instructions Detail Warning Order ir command assemble S	
AS4	Receive Orders	Detailed operations orders are briefed to the Section comds regarding the mission, execution, changes from Warning Orders, routes, ground, objective, etc.	Platoon comd to Section comd.	Platoon comd will orien christen the ground (i.e and critical map feature will give instructions re what to do at objective, consolidation location, ammo, and pogo point key information specific runner to update Sectio	

Cues	Volume	Awareness	Decisions	Comms	Workload	Training	Information Technology Goals
Auditory and visual cues that relate to a rough idea of mission, distance, likely routes and terrain, enemy, weather.	Can be very short, and the Section comd may write down key info (e.g. Orders Group time and place, 1 hr between Warning Orders and Order group) and no movement before date/time group.	Sets the situational context for awareness focus and preparation. Rely heavily on knowledge of previous events to augment current situation.	Equipment required and preparation time available based on direction (where going), probable mission and weather.	Platoon comd to Section comd. Section comd to 2IC using runner.	Generally, high cognitive workload levels at time of Wng Orders receipt as Section comd have little time available to develop their plan.	Not too difficult for either novice or experienced.	a) Electronic or text format would be useful with Platoon Comd's intent and key information listed (i.e. filtered to 1 level up, not to Company or Battalion). b) Faster Warning Order delivery (quicker relay by Platoon Comd and quicker coming down to Platoon Comd) would give more time for Section to prepare. Platoon Comd sometimes filters out necessary information.
Paper map for terrain, obstacles, boundaries, likely enemy locations and approaches.		Need to be aware of mission intent, likely routes, timings.			Reasonably high workload levels to interpret terrain.		a) Aerial photographs to provide a more up-to-date view of the battlefield and local terrain. More up-to-date and detailed maps. b) 3D digital terrain maps with decision aides (e.g. intervisibility)
Communicate critical mission details (e.g. timings, tasks, conditions, terrain, weather, distances, etc.)	Typically brief and succinct, focussing on the details and giving direction for early preparation.	Key to successful preparation is an understanding of the impending needs of the mission.	At this stage of Orders, with only general information available, decisions about preparation are very standardized.	Must inform Section members as much as possible and don't make assumptions about what they will do with it.	High cognitive and proprioceptive (writing) demands.	Novices underestimate time for preparation tasks in their estimates. Rest and feeding time tends to suffer in the end.	
Listen to orders (trace, boundaries, objective, routes, mission execution details, timings) and view map and trace details.	Orders tend to include considerable content detail. Key information are the map, the tasks and Standing Operating Procedures, and any procedural deviations.	Need to be aware of own Sections plan (i.e. route, tasks, terrain, enemy enroute, conditions, etc), actions and plans of other friendly Sections, enemy intentions, global location and intentions of larger friendly and enemy formations.	Need to identify gaps in state of knowledge and awareness during briefing so that questions can be asked of the Platoon comd for clarification.	Verbal, usually face-to-face	Busy time for Section comd since he is preparing his own plan at this point. High workload levels.	Novice Comds tend to capture all information being provided in Orders since they lack the experience necessary to identify the critical or non-SOP aspects. Experienced Comds only tend to record critical details.	Printed orders would reduce the need for Section Comds to record their own notes at the risk of missing a critical detail. Printed map and trace or electronic version of map and trace (from Platoon Comd not Battalion). These improvements would provide the Section Comd more time to prepare their Section orders.

Indice Ratings

Fnc Flow	Tasks	reduce complexity	improve timeliness	improve usability	reduce memory demand	improve accuracy	updated frequently	used frequently	high time pressure
AS1	Receive Wng O (from Pl)		X		X			X	X
AS3	Prepare Wng O	X					X		X
AS4	Receive Orders	X	X		X			X	X
AS7	Give Orders	X			X	X		X	X
AS8	Navigate - Determine Own Position	X		X		X	X	X	X
AS9	Navigate - Determine Distance Travelled				X	X	X	X	
AS10	Control Field Formation						X	X	X
AS11	React to En Fire			X					X
AS12	Locate the Enemy	X	X	X	X		X	X	X
AS13	Develop Plan	X	X		X	X		X	X
AS14	Adopt Asslt Formation/Confirm Obj Loc	X	X	X		X	X		

Attentional Demands

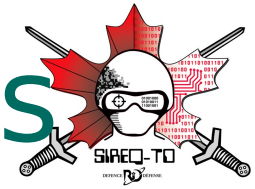


Information Elements

- Info. Transfer (intra-section)
- Info. Transfer (extra-section)
- Visualize Ground
- Determine Location
- Determine Range
- Determine Bearing
- Mission Intent
- Mission Execution
- Mission Timing
- Enemy Status Global
- Friendly Status Global
- Enemy Status Local
- Friendly Status Local
- Record Information
- Access Recorded / Ref. Info.
- Detect Trgts / Threats
- ID Trgts / Threats
- Control Individual Fire
- Control Team Fire
- Control Individual Movement
- Control Team Movement
- Plan Resource Needs
- Plan Timings
- Plan Movement
- Plan Fire

Rifleman	%
Info Transfer (intra-section)	87
Fr Status Local	66
En Status Local	61
Visualize Gnd	58
Detect Trgts/Threats	55
ID Trgts/Threats	47
Det. Loc.	42
Msn Intent	42
Msn Execution	42
Msn Timing	42
Record Info.	42
Det. Range	39
Det. Bearing	34
Access Recorded/Ref. Info	32
Indiv. Movement Control	29
Identify Resource Needs	29
Info Transfer (extra-section)	26
En Status Global	24
Fr Status Global	24
Indiv. Fire Control	24
Team Fire Control	13
Team Movement Control	11
Plan Coverage	8
Plan Fire	8
Plan Timings	5
Plan Movement	5

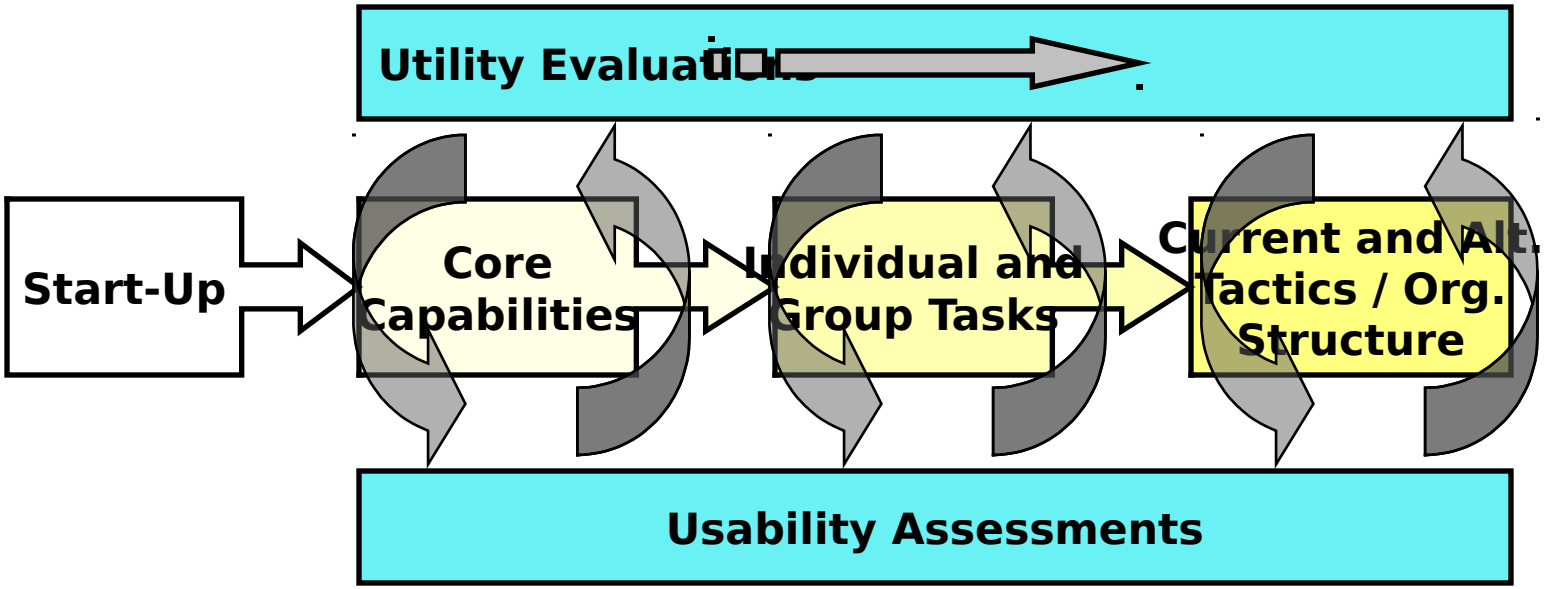
Summary Task Groupings



- Tasks
- Information Needs
- Measures of Effectiveness
- In-service Options
- Technology Options

- **Mission Planning**
  - Route Planning
  - Siting for Surveillance and Weapons
  - Mission Planning
- **Orders / Briefings**
  - Provide Orders
  - Reports / Returns
- **Visualize Ground**
  - Local
  - Navigational
  - Global
- **Control of Fire**
  - Individual Fire
  - Section Fire
- **Information Exchange**
  - Control
  - Coordination
  - Requests for Info
  - Provision of Info
- **Control of Movement**
  - Individual mobility
  - Team movement
  - Navigation
- **Information Collection**
  - Surveillance
  - Reconnaissance

SIREQ TD Plan



Core Capabilities

CORE CAPABILITIES		
Sensor Capabilities	**Information Exchange Capabilities**	**Visualization Capabilities**
Personal Night Vision: • I^2 • IR • I^2/IR Fusion	Verbal Communications: • Simple/Complex	Terrain Modelling: • In-building • Urban Streets • Open Country • Terrain Visualization
Visual STA: • Individual STA • Weapon STA • Visual Surveillance • Remote/UAV/UGV	Non-Verbal Communications: • Simple/Complex • Tactual • Visual • Auditory	Local and Global Situation Awareness: • Tactical Fusion • Info. Visualization • Augmented Reality
Non-Visual STA: • Auditory • Motion/Radar/Other • Vibration	Multi-modal: • Natural Language Input • Synthetic Voice Display	Inter-visibility Tool Mission Planning
Distributed Sensors	Non-Verbal Input Devices	Mission Briefing/Rehearsal
Sensor Fusion	Battlefield Info. Management	Mission Execution

Individual and Group Tasks

INDIVIDUAL AND GROUP TASKS				
Siting	**Orders**	**Control of Movement**	**Control of Fire**	**Navigation**
Site Enemy	Planning	Plan Movement	Plan Fire	Route Planning
Siting Fusion	Preparation	Field Formations	Fire Control	Route Card
Obs. Posts	Briefing	Tactical Mobility	Section Status	Route Navigation
STA Plan	Aide Memoires	Survivability	Netted Fires	In-building
Defensive Position Siting	Distributed Orders	Separation /Coverage	Fire Decision Aids	Urban Streets
Site Planning			BCID	Open Country
Range Cards				Wayfinding

Alternative Tactics and Organizational Structures

MISSION OPTIONS	
• Recce Patrol	• Deliberate Attack (urban)
• Fighting Patrol	• House Clearing
• Peacekeeping Patrol	• React to Sniper
• Hasty Attack / Ambush	• Hasty Defence
• Advance to Contact	• Deliberate Defence (wooded)
• Deliberate Attack (woods)	• Deliberate Defence (urban)